Binary Math

Hartley® Courseware, Inc.

Binary Math

SPECIAL FEATURES

The lessons may be **modified.**

Worksheets can be generated.

Student Planning records student errors for later review by the teacher. This file will accommodate **50 student records** before you need to erase the file.

Design Options

Grade Level 7-10

Distributed & Manufactured under license by:
dataflow
COMPUTER SERVICES PTY LTD
6-8 Elizabeth Street, Burwood. N.S.W. 2134.
Australia. Phone: (02) 745-3303.

**All Hartley courseware requires a
48K Apple II*,IIe*,IIc*, or
Franklin ACE 1000 and
one disk drive.**

**When running the program on the Apple IIe, IIc,
you must keep the CAPS LOCK key down.
On the Franklin, the LOCK key.**

© 1984 Hartley Courseware, Inc.
Dimondale, MI 48821

*Apple II, IIe & IIc are trademarks of APPLE COMPUTER, INC.

TEACHER'S GUIDE

Binary Math

Purpose/Description..........1

Running the Program..........4

For the Teacher Only

- Teacher's MENU..........9
- Modify a Lesson..........10
- Check Student Planning..........21
- Print Worksheets..........26
- Catalog Disk..........31
- Sound On/Off..........31

Instructional Objectives..........32

◆

This disk uses a high-speed operating system, Diversi-DOS™,* which is licensed for use with this program only. To legally use Diversi-DOS, you may send $30.00 directly to DSR, Inc., 5848 Crampton Ct., Rockford, IL 61111. You will receive a Diversi-DOS disk utility disk with documentation.

◆

PURPOSE/DESCRIPTION

This program was written to provide the student with an introduction to the binary numeral system. In addition to learning to work with binary numerals, the students in our test group also developed a much better understanding of their own decimal (base-10) numeral system.

The authors have introduced and reviewed many important concepts in the lessons.

Lesson B1 Number vs. Numeral

This is a critial distinction when working with bases. Number represents an amount. Numeral (of which there are many for any given amount) is a symbol. (4, 100 (base-2, IV) are all numerals for this amount of *'s:

* * * *

Lesson B2 Bases other than base-2

Bases other than 2, including base-3 and base-5 were included to make a more logical transition. This approach also gives the student a broader understanding of place value.

Lesson B3 Place Value

A review lesson on place value was included for those students who need it.

Lesson B4 Expanded Notation

A review lesson has also been included on expanding numerals. Numerals may be 'expanded' in a variety of ways. The form reviewed in this lesson is used throughout the program.

$$a(1000) + b(100) + c(10) + d(1)$$

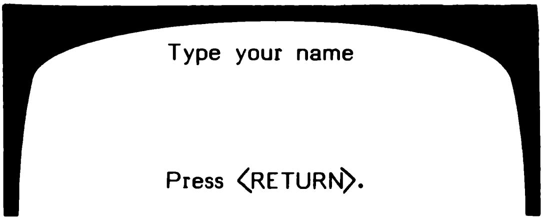
RUNNING THE PROGRAM

This program will boot on a 3.3 Disk Operating System.

When running the program on the **Apple IIe,** you must keep the **CAPS LOCK** key down at all times. On the **Franklin ACE 1000,** the **LOCK** key must be down.

Put the disk in Drive #1; close the door. Turn on your computer. If you are using an Apple II, Apple II Plus, Apple IIe, or Apple IIc, the disk will boot automatically don't type catalog!

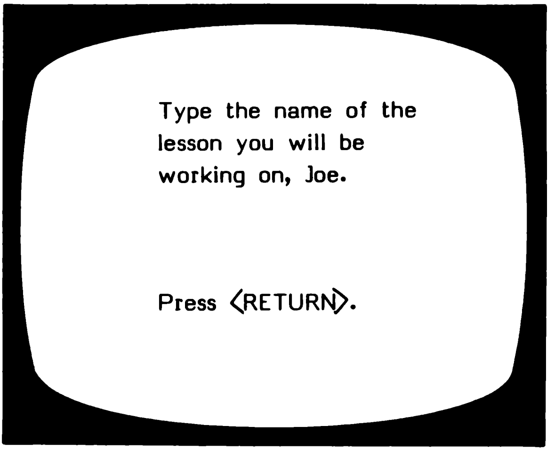
The credits will vanish and this frame appears:



Type your name

Press <RETURN>.

Type in your name and press RETURN. The next frame to appear is:



Type the name of the
lesson you will be
working on, Joe.

Press <RETURN>.

The best way to learn how to run the program is to go through it as a student would. If you don't know which lessons are available on the disk, simply type

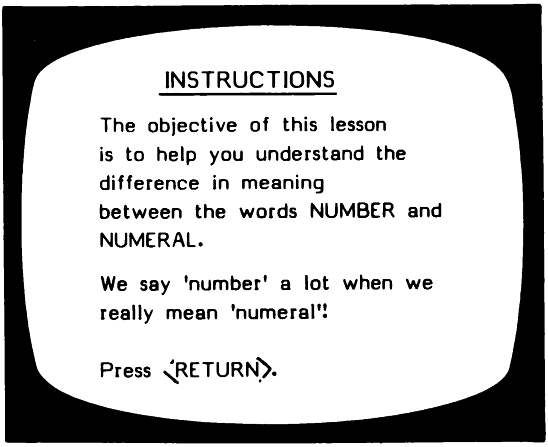
? and press **RETURN**

This will take you to the 'catalog' which will show you the list of lessons available on this disk. After all lessons on the catalog have been shown, the computer will return you to the "Type the name of the lesson you will be working on." frame. At that time, you would type in the lesson selected.

The lessons on this disk are:

B1
B2
B3
B4
REV1
B5
B6
B7
REV2
B8
B9
B10
B11
B12

After the lesson name (B1, B7, etc.) has been entered, the first screen to appear will be the Instructions for that lesson.



INSTRUCTIONS

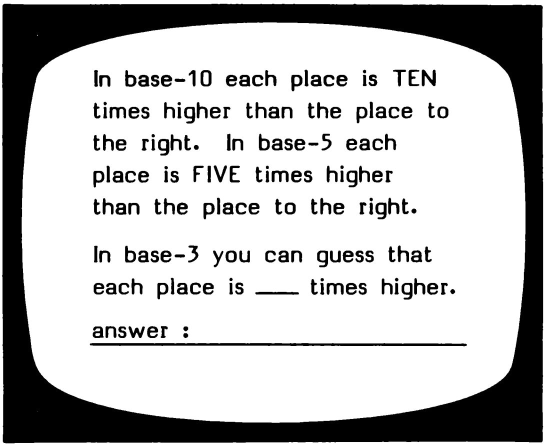
The objective of this lesson
is to help you understand the
difference in meaning
between the words NUMBER and
NUMERAL.

We say 'number' a lot when we
really mean 'numeral'!

Press <RETURN>.

The Instructions frame may be accessed at any time by the student by pressing 'H' (RETURN) when a response is called for. After the instructions, the program will automatically return to the appropriate question frame.

A typical question frame looks like this:

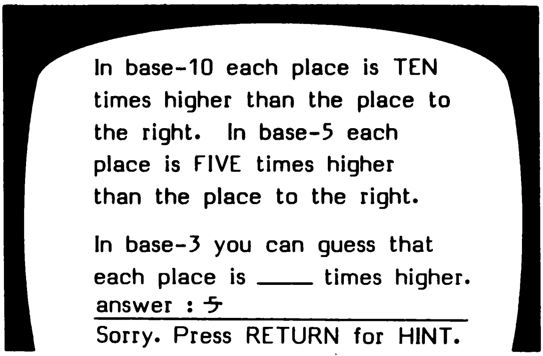


In base-10 each place is TEN times higher than the place to the right. In base-5 each place is FIVE times higher than the place to the right.

In base-3 you can guess that each place is ___ times higher.

answer :

If answered correctly, the computer will present the next question frame. If incorrect, either a hint frame or an explanation frame may be shown. A hint frame is used to guide the student toward the correct answer.

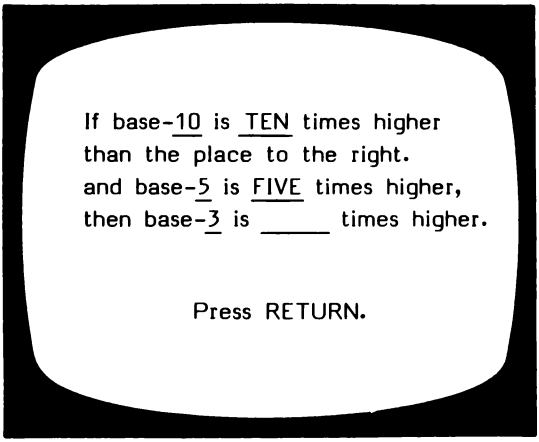


In base-10 each place is TEN times higher than the place to the right. In base-5 each place is FIVE times higher than the place to the right.

In base-3 you can guess that each place is ___ times higher.

answer : 5

Sorry. Press RETURN for HINT.



If base-10 is TEN times higher
than the place to the right.
and base-5 is FIVE times higher,
then base-3 is _____ times higher.

Press RETURN.

The computer then returns to the frame just missed, for another try. The number of chances the student is given may be set by the teacher in the Design Options. The Design Options are accessed via the Teacher's MENU (Modify a Lesson) - see page 10.

An explanation frame may also be used, depending on the content and preference of the author. These feedback frames may be changed if desired (see Teacher's MENU - Modify a Lesson).

A hint frame is generally used in tutorials to guide the student to the correct answer.

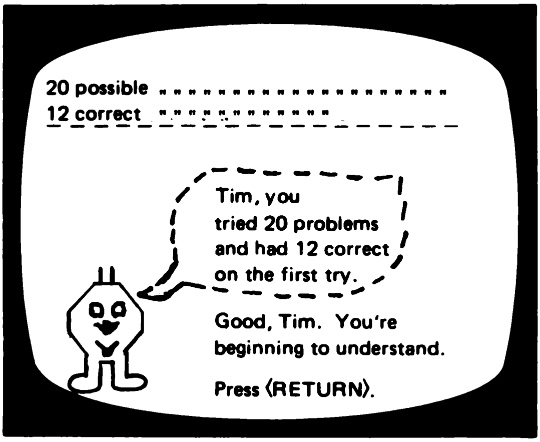
An explanation frame is generally used in a testing sequence or when more than just the answer is needed.

There is an **ESC**ape option on this program. If for some reason you wish to terminate the lesson, press **ESC** at any time a response is called for. What had been attempted to that point will be recorded on the disk.

Unless a lesson is stopped by pressing the **ESC** key when a response is called for, all items in the lesson will be presented. All items missed are stored in the Student Planning file for later review by the teacher.

At the end of the lesson, the student will be shown the following screen indicating the number correct out of the number attempted. A little graphic, "GORB", 'tells' the student how well he/she did on the lesson just completed.

Introducing.....**GORB!**



20 possible "
12 correct " " " " " " " " " " " "

Tim, you tried 20 problems and had 12 correct on the first try.

Good, Tim. You're beginning to understand.

Press ⟨RETURN⟩.

The computer will then return you to the "Type your name." frame, ready for another student or another lesson.

If the teacher has set the computer to terminate a lesson after a student gets 10* questions correct in a row, the graph above will change slightly when the student achieves this criterion. Example:

20 possible "
12 correct out of 14 attempts

GORB will say: "Tim, you tried 14 problems
and had 10 in a row correct."

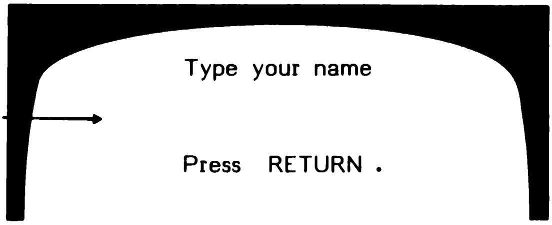
*This can be any number set by the teacher.

FOR THE TEACHER ONLY

Teacher's MENU

The lessons on this disk are for the student. There are also programs for the teacher. These programs allow the teacher to "do things" to the student lessons on the disk.

The teacher's programs are accessed by using the name MENU when the following screen is shown:

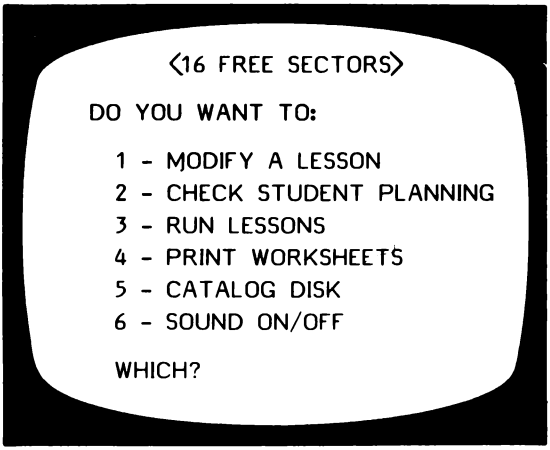


Type

MENU

```
Type your name


Press  RETURN .
```

The following MENU will appear:



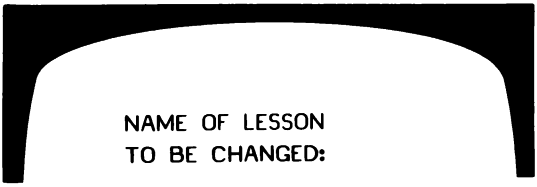
```
      <16 FREE SECTORS>

DO YOU WANT TO:

   1 - MODIFY A LESSON
   2 - CHECK STUDENT PLANNING
   3 - RUN LESSONS
   4 - PRINT WORKSHEETS
   5 - CATALOG DISK
   6 - SOUND ON/OFF

   WHICH?
```

The following pages describe exactly how to use each of these programs on the Teacher's MENU.

1 - MODIFY A LESSON

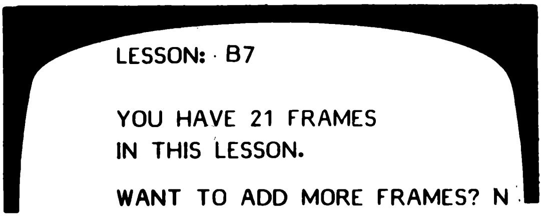
If you wish to change a lesson on the disk, select **1 Modify a Lesson** from the Teacher's MENU.

Identify the lesson you wish to change:



```
NAME OF LESSON
TO BE CHANGED:
```

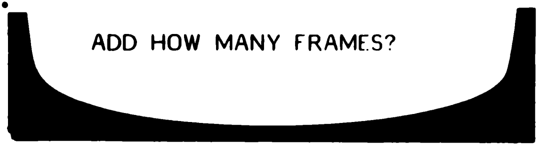
The lesson will be loaded into the computer. You can either add more frames or change existing ones.



```
LESSON: B7

YOU HAVE 21 FRAMES
IN THIS LESSON.

WANT TO ADD MORE FRAMES? N
```

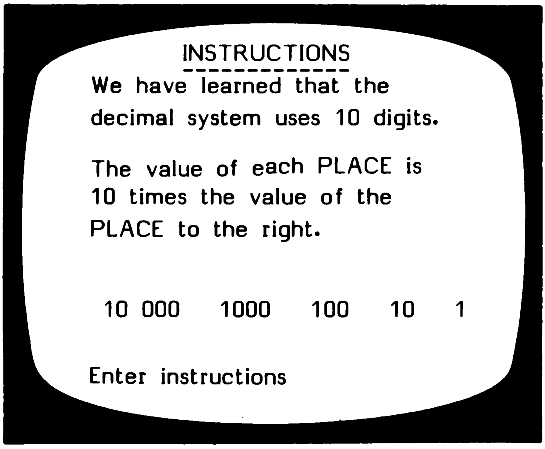
Adding Frames

If you want to increase the number of items, type **Y.** You are limited to **30 frames per lesson.** You will then be asked:



```
ADD HOW MANY FRAMES?
```

After indicating the number of frames you wish to add to the lesson, the Instructions frame will be shown. The cursor will be on the first line of the Instructions, which may look like this:



INSTRUCTIONS

We have learned that the
decimal system uses 10 digits.

The value of each PLACE is
10 times the value of the
PLACE to the right.

10 000   1000   100   10   1

Enter instructions

This frame may be accessed at any time by pressing **H** when a response is called for.

If you need to type a subscript or superscript in the instructions, see page 12.

You may type new Instructions. If you don't wish to change a line, just press **RETURN** to move the cursor to the next line.

If you are adding frames, you will be shown the frame you wish to add. (If the lesson already had 19 items, Frame #20 will appear blank, the cursor on the first line, ready for you to type in the item.)

To capitalize a letter, press the '^' just before the letter to be capitalized. **To make a '_'** in a question, use the '@' sign.

You should be able to enter 30 regular size characters per line and more if you use the subscripts and exponents.

Notes to a would be author.....

It is very easy to change any of the content of the lessons. The only difficulty you will have is with the use of subscripts, superscripts and the "cross out". As these are not native to the Apple II or IIe, you will need to us a two-key code to generate the special characters.

Subscripts are rather easy. Superscripts are much trickier because of the difficulty in placing them next to the numeral.

$$\begin{array}{rrr} & {}^{10} & \\ \cancel{1} & 0 & 1 \\ - & 1 & 1 \\ \hline & 1 & 0 \end{array}$$

line 1
line 2

To type the ten, you can use superscripts on line 2, OR subscripts on line 1.

To enter subscripts or superscripts (exponents), you must use the following keys:

&0 = superscript 0
&1 = " 1
&2 = " 2
&3 = " 3
&4 = " 4
&5 = " 5
&6 = " 6
&7 = " 7
&8 = " 8
&9 = " 9

First press the **&** (use the SHIFT key) then type the number.

Superscripts may also be used for exponents if desired.

&q = subscript 1
&w = " 0
&e = " 2
&r = " 5

&/ = cross out next character entered. It must PRECEDE the character you wish to cross out.ie.

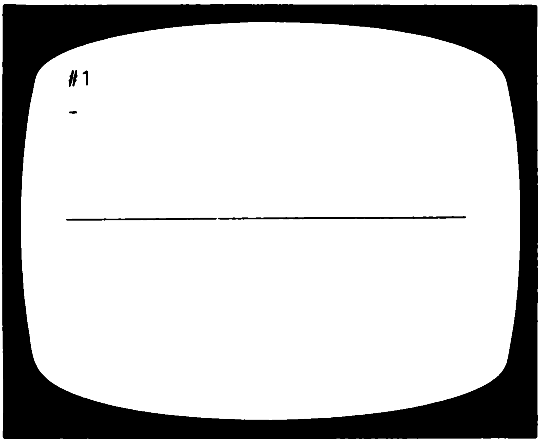
&/8 = $\cancel{8}$

When you try to use the back-up arrow (←) to erase the slash mark (/) for any reason, the bottom half will erase from the screen and leave the top half. It will be gone from the finished program, even though you can still see part of it! The slash mark is a bigger than normal character, making it more difficult to erase from the screen, but not within the program.

Frames may be either question frames or information frames.

Question frame

This may take any format you would like. Here is what a blank frame looks like before any words are typed into it.



You may enter 8 lines here.

You may enter up to 4 acceptable responses. The first response listed will be shown as feedback to the student.

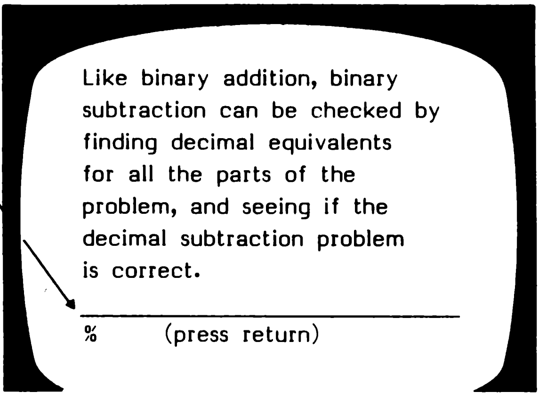
Instead of entering and accepting any of four answers as correct, the teacher can restrict the student to answering with a letter (A,B,C,D,E,F). This can be determined on a lesson-by-lesson basis via the Design Options (see page 16).

Instead of a Question frame, you may enter an 'Information' frame. When an information frame precedes a question, the student can (by use of the ← key), go back to the Information frame for help in answering the question.

Information Frame

This frame requires no response.

The **%** sign in the answer's place will indicate to the computer that there will be no answer.

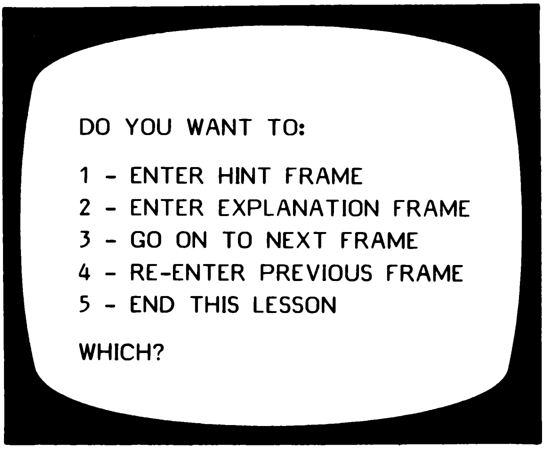


Like binary addition, binary
subtraction can be checked by
finding decimal equivalents
for all the parts of the
problem, and seeing if the
decimal subtraction problem
is correct.

% (press return)

Adding frames (or changing frames)

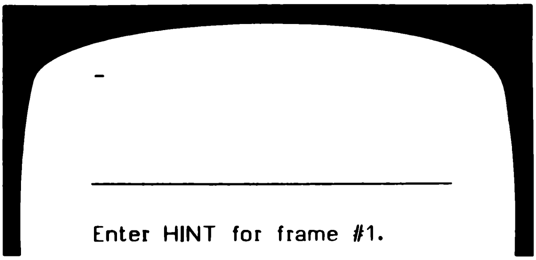
After entering a new frame, or changing an existing frame, you will then branch to the 'Secondary' MENU.



```
DO YOU WANT TO:

1 - ENTER HINT FRAME
2 - ENTER EXPLANATION FRAME
3 - GO ON TO NEXT FRAME
4 - RE-ENTER PREVIOUS FRAME
5 - END THIS LESSON

WHICH?
```

This allows you to enter a 'Hint' frame or an 'Explanation' frame. The hint frame will be shown to the student after (s)he misses the question. If you wish to enter a hint frame for the first question, select **1 - Enter hint frame** and this will appear:

You may enter
6 lines of text.



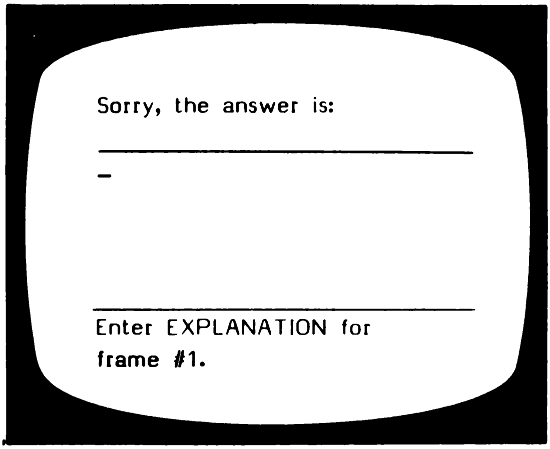
```
-



________________________________

Enter HINT for frame #1.
```

After entering the hint frame and pressing **RETURN**, the computer will automatically place you at the next frame (assuming you were entering more than one additional frame), ready for the next question or more information.

Select 2 - **Enter explanation frame.** This would be used when a hint might not be appropriate, but you want to give the student feedback other than just the answer. The explanation frame will be shown to the student after he has missed the question on his last try. (The number of tries is set by the teacher at the end of the lesson by using the Design Options.)

The first alternative answer is shown to the student.

You may enter 6 lines.



Sorry, the answer is:

Enter EXPLANATION for frame #1.

If you select 3 - **Go on to next frame,** you will be taken to the next consecutive frame without entering a hint or explanation frame for the previous question.

You may 4 - **Re-enter previous frame** if you have given a hint frame and want to look at the question frame you just entered.

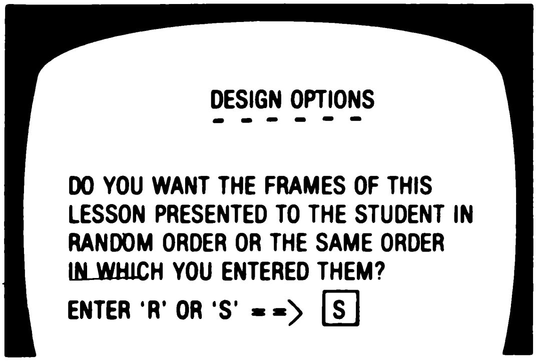
Selecting 5 - **End this lesson** will take you to the **DESIGN OPTIONS** for the lesson you have just entered. The first frame will ask you to enter the concept being taught,ie.,

CONCEPT: PLACE VALUE BASE 5 AND 2

Unless you are completely rewriting the lesson, you may want to leave the concept which is already listed. The concept is used in the Student Planning section.

Design Options

The first of the Design Options will be given:



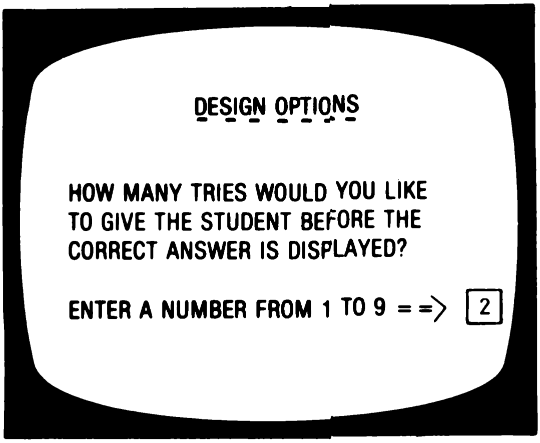
DESIGN OPTIONS
- - - - - -

DO YOU WANT THE FRAMES OF THIS
LESSON PRESENTED TO THE STUDENT IN
RANDOM ORDER OR THE SAME ORDER
IN WHICH YOU ENTERED THEM?

ENTER 'R' OR 'S' ==> S

For instructional lessons that are carefully sequenced, you would want them presented in the same order. For drill or tests, you may want random order.

If you are using the hint option, you will need at least 2 tries.

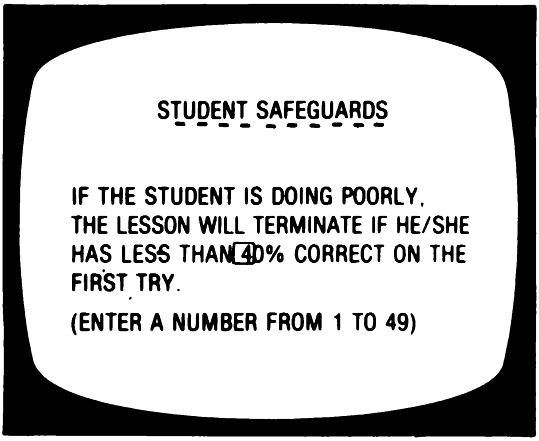


DESIGN OPTIONS
- - - - - - -

HOW MANY TRIES WOULD YOU LIKE
TO GIVE THE STUDENT BEFORE THE
CORRECT ANSWER IS DISPLAYED?

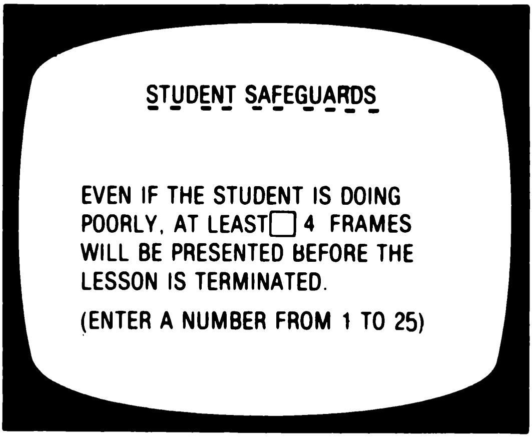
ENTER A NUMBER FROM 1 TO 9 ==> 2

The following 'Student Safeguards' allow you to set the criteria upon which the computer will branch to the end of the lesson. It is the philosophy of the teachers who designed this disk that if a lesson is too easy or too difficult, the computer should terminate the lesson. The TEACHER should make the new prescription.



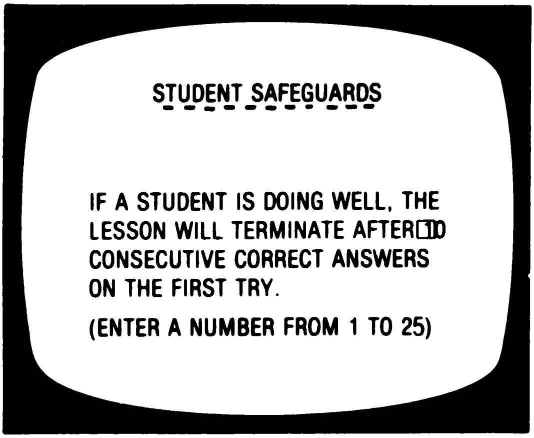
```
          STUDENT SAFEGUARDS
          - - - - - - - - - -

IF THE STUDENT IS DOING POORLY,
THE LESSON WILL TERMINATE IF HE/SHE
HAS LESS THAN☐40% CORRECT ON THE
FIRST TRY.

(ENTER A NUMBER FROM 1 TO 49)
```

The next question relates to the above decision.



```
          STUDENT SAFEGUARDS
          - - - - - - - - - -

EVEN IF THE STUDENT IS DOING
POORLY, AT LEAST☐4 FRAMES
WILL BE PRESENTED BEFORE THE
LESSON IS TERMINATED.

(ENTER A NUMBER FROM 1 TO 25)
```

You will need to skip at least some frames. If you don't, the lesson will terminate on the first frame if there is an error (0% will be below any % that you set in the previous step).

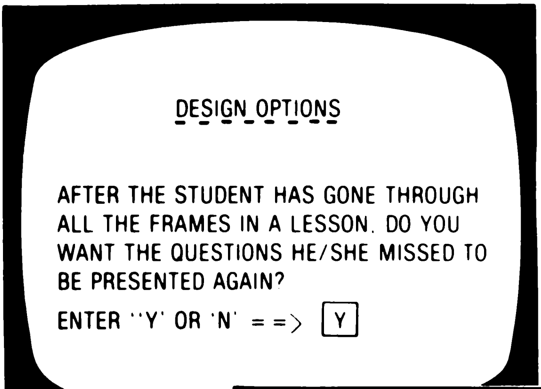


```
STUDENT SAFEGUARDS
- - - - - - - - - - -

IF A STUDENT IS DOING WELL, THE
LESSON WILL TERMINATE AFTER 10
CONSECUTIVE CORRECT ANSWERS
ON THE FIRST TRY.
(ENTER A NUMBER FROM 1 TO 25)
```

If there is a variety of skills taught or reviewed in one lesson, you may want the student to complete all the work no matter how well (s)he does on the first 10. If so, change to 25 or the number of problems in the lesson.

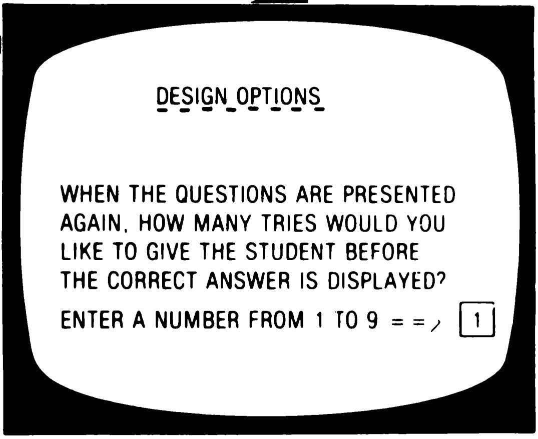
Note: By using the random order option and the Design Options, this disk was designed to allow you to create a modifiable item pool. Rather than drawing a specific number of items, the items will be used until the student meets the criteria you specified (in terms of the number of items in a row correct).

This type of criteria was considered preferable to a percent because it takes into account the fact that the child may do poorly in the beginning but learn the concept during the lesson and begin to answer all items correctly.



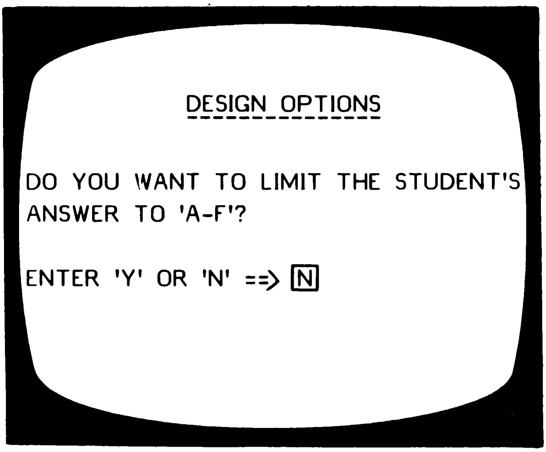
```
          DESIGN_OPTIONS
          - - - - - - - -

AFTER THE STUDENT HAS GONE THROUGH
ALL THE FRAMES IN A LESSON. DO YOU
WANT THE QUESTIONS HE/SHE MISSED TO
BE PRESENTED AGAIN?
ENTER ''Y' OR 'N' ==> [Y]
```

The student safeguards do not apply to these questions. The authors assumed the teacher would want all missed items reviewed.



```
          DESIGN_OPTIONS
          - - - - - - - -

WHEN THE QUESTIONS ARE PRESENTED
AGAIN, HOW MANY TRIES WOULD YOU
LIKE TO GIVE THE STUDENT BEFORE
THE CORRECT ANSWER IS DISPLAYED?
ENTER A NUMBER FROM 1 TO 9 ==> [1]
```

The last decision to make is whether or not to allow the student to type in the answer, or only accept the letter A,B,C,D,E, or F, whichever represents the correct answer in the question.



```
          DESIGN OPTIONS
          --------------

DO YOU WANT TO LIMIT THE STUDENT'S
ANSWER TO 'A-F'?

ENTER 'Y' OR 'N' ==> [N]
```

After all the Design Options have been set, you will be asked if you want to:

SAVE THIS LESSON? (Y/N)

If you type **Y**, the changes you have made will be incorporated into the lessons on the disk. If you type **N**, the lesson will be saved in its original form. You will then be returned to the Teacher's MENU.

Changing Frames

If you want to change existing frames, select the **1 - Change a lesson** option from the Teacher's MENU.

If you just wish to change some of the frames and not add new items, answer **N** to the question:

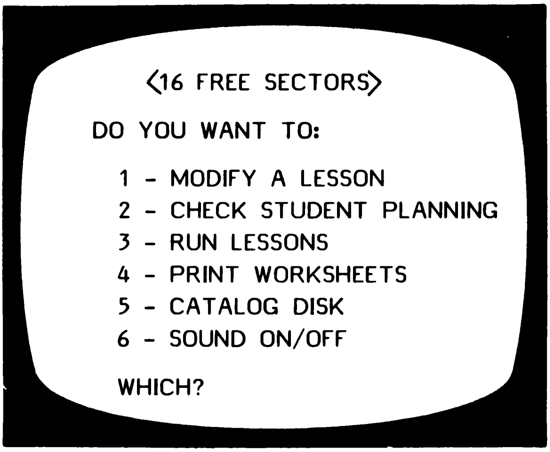
ADD MORE FRAMES? (Y/N)

You will be shown all the frames as they exist. If you wish to change a line, type in the new line. If no change is desired, press **RETURN** to go on to the next line. Use the ← key to back up to the preceding line or frame. Use the → key as a short cut to go from frame to frame.

Review pages 14,15 for adding hint or explanation frames. If you do not want to page through all of the frames, type **END** at the beginning of the first line of a question or information frame. This will branch you to the Design Options. The changes made up to (but not including) this frame will be saved ALONG WITH THE REMAINING UNCHANGED FRAMES.

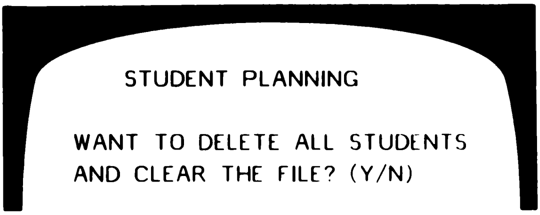
2 - CHECK STUDENT PLANNING

As a student works through a lesson, the errors that (s)he makes are recorded into the Student Planning file. To see this file, bring up the Teacher's MENU.



```
   <16 FREE SECTORS>

DO YOU WANT TO:

   1 - MODIFY A LESSON
   2 - CHECK STUDENT PLANNING
   3 - RUN LESSONS
   4 - PRINT WORKSHEETS
   5 - CATALOG DISK
   6 - SOUND ON/OFF

   WHICH?
```

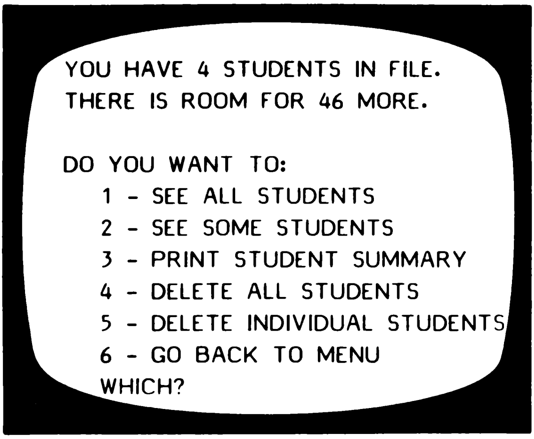
and select **2 - Check Student Planning.** The first frame to appear is:



```
   STUDENT PLANNING

WANT TO DELETE ALL STUDENTS
AND CLEAR THE FILE? (Y/N)
```

Type **N** if you want to see the file; **Y** if you want to completely erase all student results. Press **RETURN.**

If you typed **N,** indicating you would like to see the file and not erase it, this frame will appear:



```
YOU HAVE 4 STUDENTS IN FILE.
THERE IS ROOM FOR 46 MORE.

DO YOU WANT TO:
   1 - SEE ALL STUDENTS
   2 - SEE SOME STUDENTS
   3 - PRINT STUDENT SUMMARY
   4 - DELETE ALL STUDENTS
   5 - DELETE INDIVIDUAL STUDENTS
   6 - GO BACK TO MENU
   WHICH?
```

If you choose 1 - **See all students,** the computer asks:

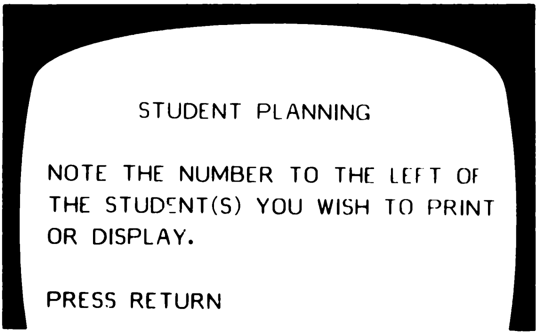
ARE YOU USING A PRINTER? (Y/N)

If **Y**, it will ask for the slot. It will usually be **1** or **2.** If you're not sure, turn off your computer, take off the cover and check. Your printer card interface should be located in slot 1 or 2. Type the slot number; all the records will be printed.

If you're not using a printer, results will be displayed on the screen. Scrolling of results is under control of the teacher.

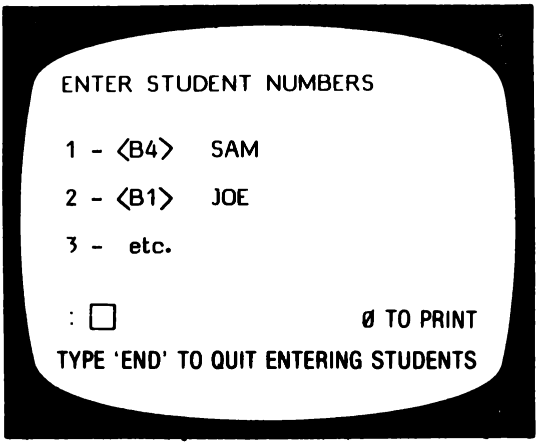
If you want to see only some of the students' records, select **2 - See some students** and press **RETURN.**

This frame appears:



```
          STUDENT PLANNING

NOTE THE NUMBER TO THE LEFT OF
THE STUDENT(S) YOU WISH TO PRINT
OR DISPLAY.

PRESS RETURN
```

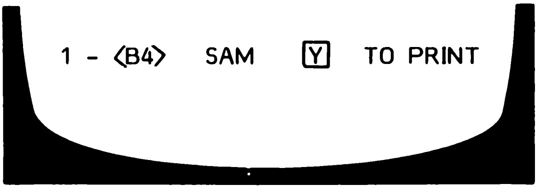
As you select the students whose records you want to view, you will be typing just the <u>number</u> of the student.



```
ENTER STUDENT NUMBERS

1 - <B4>   SAM

2 - <B1>   JOE

3 -  etc.

: ☐                     0 TO PRINT
TYPE 'END' TO QUIT ENTERING STUDENTS
```

◀ The computer keeps a running tally on the <u>number</u> of students you have selected.

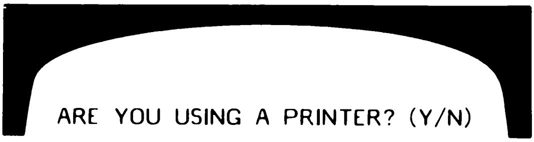
Type the <u>number</u> of a student you want to see and press **RETURN**. For example: If you type **2**, the lesson name and student name will appear at the bottom of the frame. This is a check. Press **RETURN** if that is the student you wish to see. This gives you a chance to change your mind and enter **N** if you don't want to see that particular student.



```
1 - <B4>   SAM   Y   TO PRINT
```

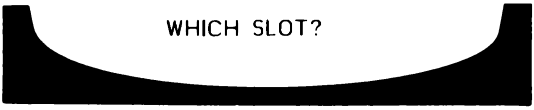
Continue selecting students whose records you want to see. When you have entered all of the students you wish to see, type **END** (in place of another number).

The following frame will appear:



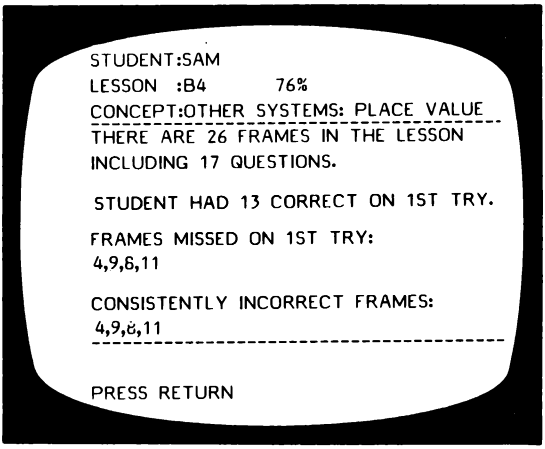
```
ARE YOU USING A PRINTER? (Y/N)
```

If you type **N**, the records will come up on your monitor. If you type **Y**, you will be asked:



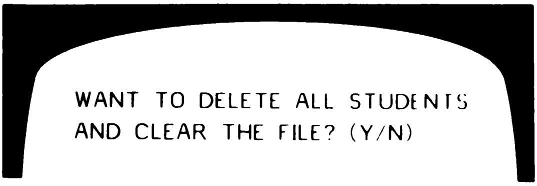
```
WHICH SLOT?
```

It will usually be **1** or **2**. If you're not sure, turn off your computer, take off the cover and check the slot number. The printout will be in the following format:



```
STUDENT:SAM
LESSON  :B4        76%
CONCEPT:OTHER SYSTEMS: PLACE VALUE
---------------------------------------
THERE ARE 26 FRAMES IN THE LESSON
INCLUDING 17 QUESTIONS.

STUDENT HAD 13 CORRECT ON 1ST TRY.

FRAMES MISSED ON 1ST TRY:
4,9,6,11

CONSISTENTLY INCORRECT FRAMES:
4,9,8,11
---------------------------------------

PRESS RETURN
```

After all information is displayed, you will be asked:

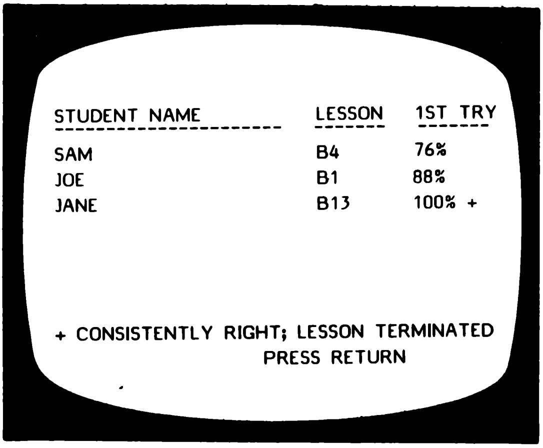


```
WANT TO DELETE ALL STUDENTS
AND CLEAR THE FILE? (Y/N)
```

Respond as desired.

The **ESC** key can be pressed at any time to terminate display or printout of student results. A maximum of **50 student records** can be stored in this Student Planning file before it must be emptied. To empty the file, answer **Y** to the question at the end of the display/printout, or use option **4** from the Student Planning Menu - **Delete all students.**

3 - Print Student Summary from the Student Planning MENU allows you to see or print out a summary of records for the entire class. The summary is in the following format:



```
STUDENT NAME                LESSON   1ST TRY
--------------------        -------  -------
SAM                         B4       76%
JOE                         B1       88%
JANE                        B13      100% +




+ CONSISTENTLY RIGHT; LESSON TERMINATED
                 PRESS RETURN
```

The printout of the Student Summary will include <u>more</u> information than you can see on the screen. The printout includes the skill statement and the number correct/number of questions.

```
                                           NUMBER
STUDENT NAME    LESSON    1ST TRY         CORRECT      SKILL
--------------- -------   -------         --------     ------------

SAM              B4        76%            13/17       OTHER SYSTEMS
                                                       PLACE VALUE
```

4 - Delete all students

If you want to clear all of your records, use this option.

5 - Delete individual students

A number of teachers have asked for this option. This is most valuable when several teachers are using the same disk. This allows you to print the records of just a few of your students and then erase only those selected records from the file. The procedure is the same as "See some students".

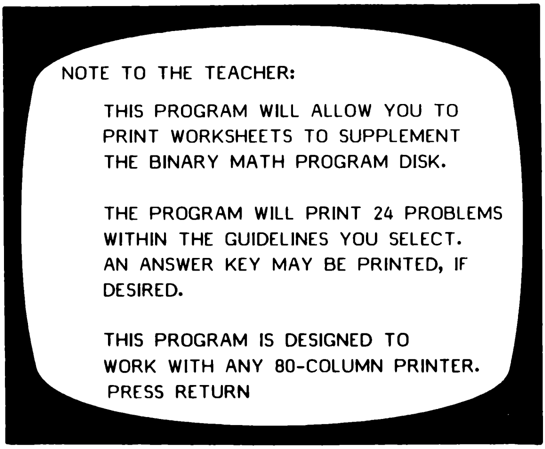
3 - RUN LESSONS

See pages 4-8 for an explanation of how to Run Lessons.

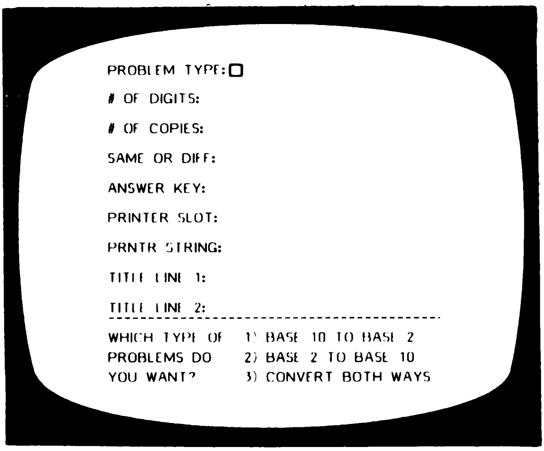
4 - PRINT WORKSHEETS

This is a simple worksheet generator program which allows you to print worksheets to provide additional practice in the conversion of numerals from binary to base-10. The worksheets can be used to supplement Lessons B9 and B10.

After selecting 4 - **Print Worksheet** from the Teacher's MENU, this frame appears:

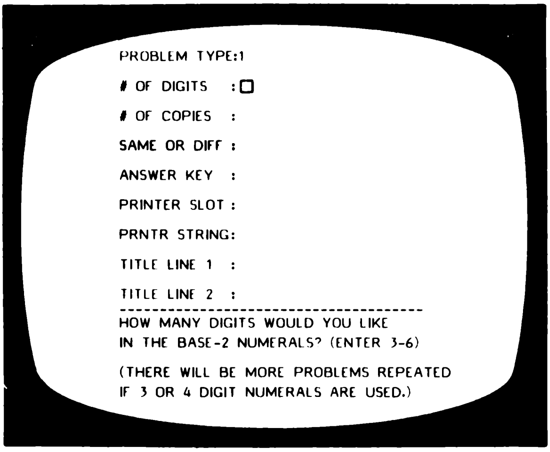


```
NOTE TO THE TEACHER:

     THIS PROGRAM WILL ALLOW YOU TO
     PRINT WORKSHEETS TO SUPPLEMENT
     THE BINARY MATH PROGRAM DISK.

     THE PROGRAM WILL PRINT 24 PROBLEMS
     WITHIN THE GUIDELINES YOU SELECT.
     AN ANSWER KEY MAY BE PRINTED, IF
     DESIRED.

     THIS PROGRAM IS DESIGNED TO
     WORK WITH ANY 80-COLUMN PRINTER.
      PRESS RETURN
```

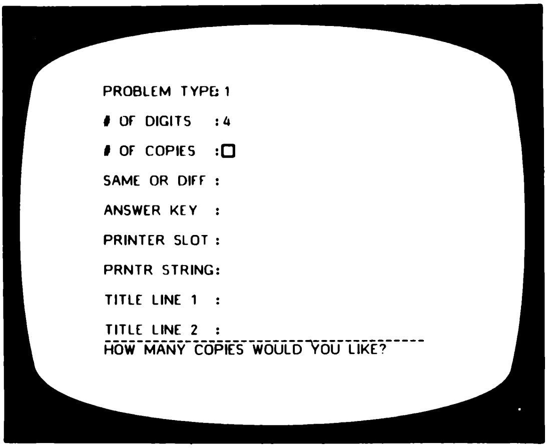


```
PROBLEM TYPE:☐
# OF DIGITS:
# OF COPIES:
SAME OR DIFF:
ANSWER KEY:
PRINTER SLOT:
PRNTR STRING:
TITLE LINE 1:
TITLE LINE 2:
---------------------------------------
WHICH TYPE OF    1) BASE 10 TO BASE 2
PROBLEMS DO      2) BASE 2 TO BASE 10
YOU WANT?        3) CONVERT BOTH WAYS
```

# of digits refers to the number of digits in Base-2. Keep in mind that there are only six different possible problems for a 3-digit, base-2 numeral. This means that each problem will be used 4 times (on the average). If you use 6 digits, the computer will generate <u>non-duplicated</u> problems, but will include a few 5-digit items.



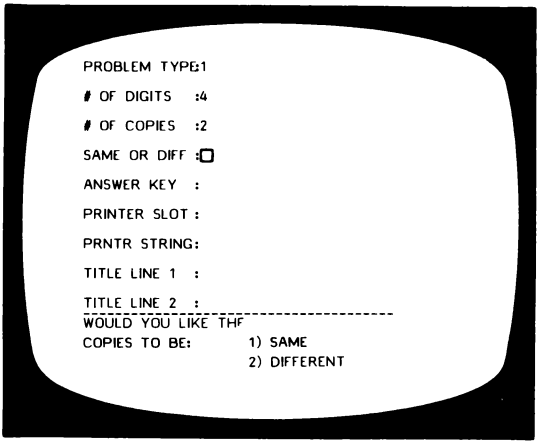
```
PROBLEM TYPE:1
# OF DIGITS   :☐
# OF COPIES   :
SAME OR DIFF :
ANSWER KEY   :
PRINTER SLOT :
PRNTR STRING:
TITLE LINE 1   :
TITLE LINE 2   :
---------------------------------------
HOW MANY DIGITS WOULD YOU LIKE
IN THE BASE-2 NUMERALS? (ENTER 3-6)

(THERE WILL BE MORE PROBLEMS REPEATED
IF 3 OR 4 DIGIT NUMERALS ARE USED.)
```



```
PROBLEM TYPE: 1
# OF DIGITS    : 4
# OF COPIES    :☐
SAME OR DIFF :
ANSWER KEY   :
PRINTER SLOT :
PRNTR STRING:
TITLE LINE 1   :
TITLE LINE 2   :
---------------------------------------
HOW MANY COPIES WOULD YOU LIKE?
```

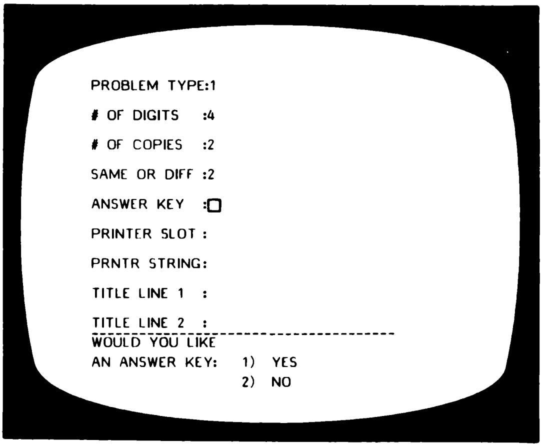
You may have as many worksheets generated as desired.

If you generate more than 1 worksheet, you may have them the same or different. If you choose 2) different, you will have the same problems but in different order.



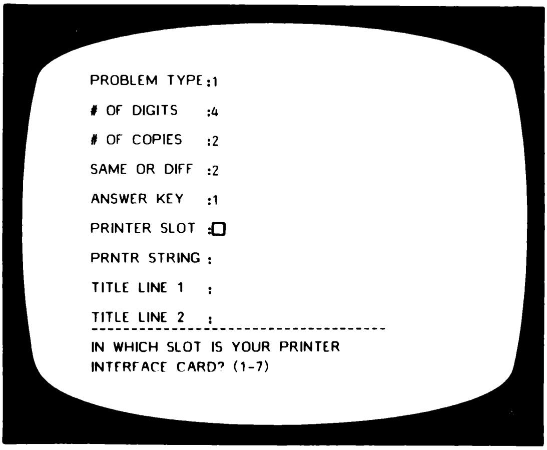
```
PROBLEM TYPE:1
# OF DIGITS   :4
# OF COPIES   :2
SAME OR DIFF :☐
ANSWER KEY   :
PRINTER SLOT :
PRNTR STRING:
TITLE LINE 1   :
TITLE LINE 2   :
----------------------------------------
WOULD YOU LIKE THE
COPIES TO BE:        1) SAME
                     2) DIFFERENT
```

The computer will print 1 answer key if you select 'same' on the previous screen. If you select different, you will have a different answer key for each worksheet. The answer key will immediately precede the worksheet.

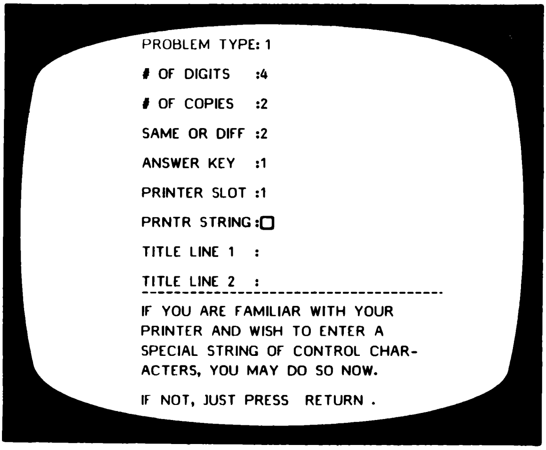


```
PROBLEM TYPE:1
# OF DIGITS   :4
# OF COPIES   :2
SAME OR DIFF :2
ANSWER KEY   :☐
PRINTER SLOT :
PRNTR STRING:
TITLE LINE 1   :
TITLE LINE 2   :
----------------------------------------
WOULD YOU LIKE
AN ANSWER KEY:    1)  YES
                  2)  NO
```

If you're not sure, take the top off your computer and check your printer card (usually 1 or 2).

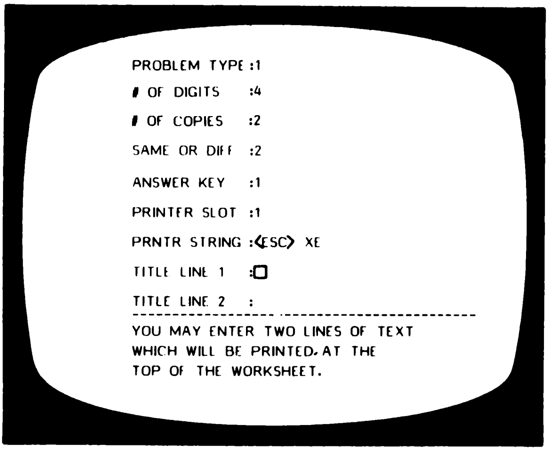


```
PROBLEM TYPE :1
# OF DIGITS    :4
# OF COPIES    :2
SAME OR DIFF  :2
ANSWER KEY    :1
PRINTER SLOT :☐
PRNTR STRING :
TITLE LINE 1    :
TITLE LINE 2    :
----------------------------------------
IN WHICH SLOT IS YOUR PRINTER
INTERFACE CARD? (1-7)
```



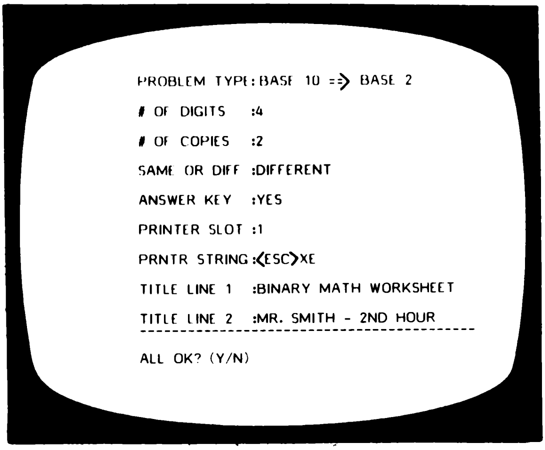
```
PROBLEM TYPE: 1
# OF DIGITS    :4
# OF COPIES    :2
SAME OR DIFF  :2
ANSWER KEY    :1
PRINTER SLOT :1
PRNTR STRING:☐
TITLE LINE 1   :
TITLE LINE 2   :
----------------------------------------
IF YOU ARE FAMILIAR WITH YOUR
PRINTER AND WISH TO ENTER A
SPECIAL STRING OF CONTROL CHAR-
ACTERS, YOU MAY DO SO NOW.
IF NOT, JUST PRESS  RETURN .
```

This allows you to print in smaller characters, add extra space, double strike for special masters, or any other capability your printer/card will allow. If you don't know what to put here, just press RETURN.



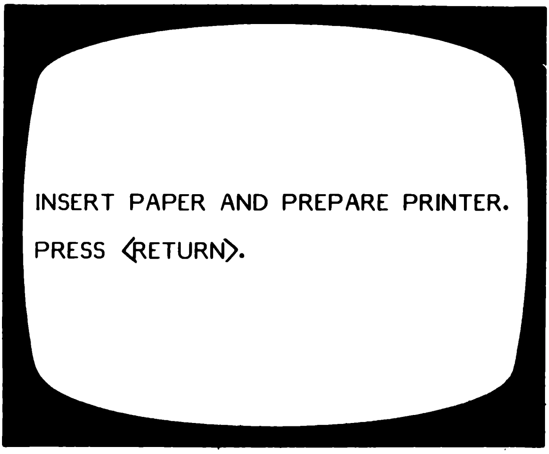
```
PROBLEM TYPE :1
# OF DIGITS    :4
# OF COPIES    :2
SAME OR DIFF  :2
ANSWER KEY    :1
PRINTER SLOT  :1
PRNTR STRING :<ESC> XE
TITLE LINE 1   :☐
TITLE LINE 2   :
----------------------------------------
YOU MAY ENTER TWO LINES OF TEXT
WHICH WILL BE PRINTED. AT THE
TOP OF THE WORKSHEET.
```

Put in a message or worksheet identification. It will be typed on the top of your worksheet and the answer key.



```
PROBLEM TYPE:BASE 10 ==> BASE 2
# OF DIGITS    :4
# OF COPIES    :2
SAME OR DIFF  :DIFFERENT
ANSWER KEY    :YES
PRINTER SLOT :1
PRNTR STRING:<ESC>XE
TITLE LINE 1   :BINARY MATH WORKSHEET
TITLE LINE 2   :MR. SMITH - 2ND HOUR
----------------------------------------
ALL OK? (Y/N)
```

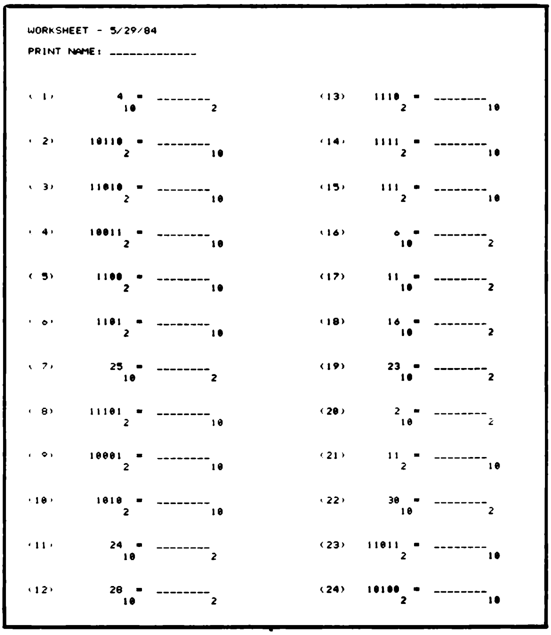
If you wish to make changes, answer **N** and you will start over at the first frame. If everything is OK, press **Y**.



INSERT PAPER AND PREPARE PRINTER.

PRESS <RETURN>.

This is a sample of a Binary Math worksheet generated by this method.

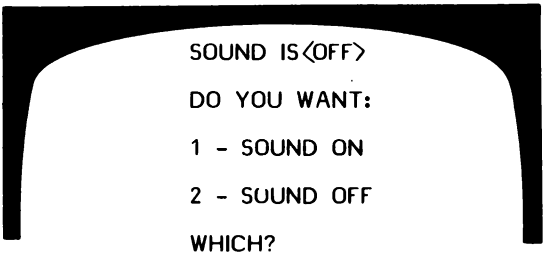


```
WORKSHEET - 5/29/84

PRINT NAME: _____________


( 1)        4  =  ________           (13)    1110  =  ________
          10              2                    2              10

( 2)    10110  =  ________           (14)    1111  =  ________
            2             10                   2              10

( 3)    11010  =  ________           (15)     111  =  ________
            2             10                   2              10

( 4)    10011  =  ________           (16)       6  =  ________
            2             10                  10               2

( 5)     1100  =  ________           (17)      11  =  ________
            2             10                  10               2

( 6)     1101  =  ________           (18)      16  =  ________
            2             10                  10               2

( 7)       25  =  ________           (19)      23  =  ________
           10              2                  10               2

( 8)    11101  =  ________           (20)       2  =  ________
            2             10                  10               2

( 9)    10001  =  ________           (21)      11  =  ________
            2             10                   2              10

(10)     1010  =  ________           (22)      30  =  ________
            2             10                  10               2

(11)       24  =  ________           (23)   11011  =  ________
           10              2                   2              10

(12)       28  =  ________           (24)   10100  =  ________
           10              2                   2              10
```

5 - CATALOG DISK

This file holds a list of all lessons on this disk. This can also be accessed by typing a ? when the "Type the name of the lesson you will be working on." appears.

6 - SOUND ON/OFF



```
SOUND IS<OFF>

DO YOU WANT:

1 - SOUND ON

2 - SOUND OFF

WHICH?
```

After making your selection, you will be returned to the Teacher's MENU.

INSTRUCTIONAL OBJECTIVES

B1 The student will identify numerals as symbols which represent a number. The student will also identify numbers as the actual amount of a thing.

The student will identify the smallest digit in the base-10 system as 0 and the largest digit as 9.

B2 This is a review of place value. Given a 4-digit decimal numeral, the student will correctly identify the place value of each digit.

B3 This is a review of Expanded Notation. Given up to a 4-digit numeral (base-10), the student will correctly expand it using the form:

$$a(1000) + b(100) + c(10) + d(1)$$

B4 Given a numeral in the base-10 or base-5 numeral system, the student will indicate:

(a) The ONES place is on the right.

(b) Each place is the 'base' times the place to the right.

(c) The 'base' of a numeral system indicates the number of different digits that may be used in writing the numerals.

REV1 Review of B1 through B4.

B5 The student will be able to determine the value of any place in base-5, base-3, or base-2.

B6 The student will identify a numeral with a subscript as having the base indicated by the subscript.

The student will identify a numeral without a subscript as being in the base-10 system.

B7 The student will be able to find the base-10 equivalent of numerals in base-5.

REV2 Review of B5 through B7.

B8 The student will be able to find the decimal (base-10) equivalent of binary (base-2) numerals.

B9 The student will be able to find the binary equivalent of decimal numerals.

B10 The student will be able to add two 4-digit binary numerals with or without regrouping.

The student will learn to add up to four 1-digit binary numerals (column addition).

B11 Practice on the addition of binary numerals.

B12 The student will be able to subtract two 4-digit binary numerals with or without regrouping.

Binary Math

Grades 7-10

This two-disk program will give your students the introduction they need to the binary number system. A brief explanation of other number bases is included. Practice is provided in converting from the base 10 system to the binary system. The lessons are carefully sequenced in difficulty. Explanations of incorrect answers are given for difficult items. The program may be used independently or as a supplement to classroom activity. This is a good program for a Computer Literacy class. Reproducible diagnostic tests are provided for use in determining student needs.

©Hartley Courseware, Inc.

Dimondale, MI 48821 (517) 646-6458

22-15